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GEOLOGY AND MINERALOGY

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NEW LONDON & WINDHAM COUNTIES.





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# **GEOLOGY AND MINERALOGY**

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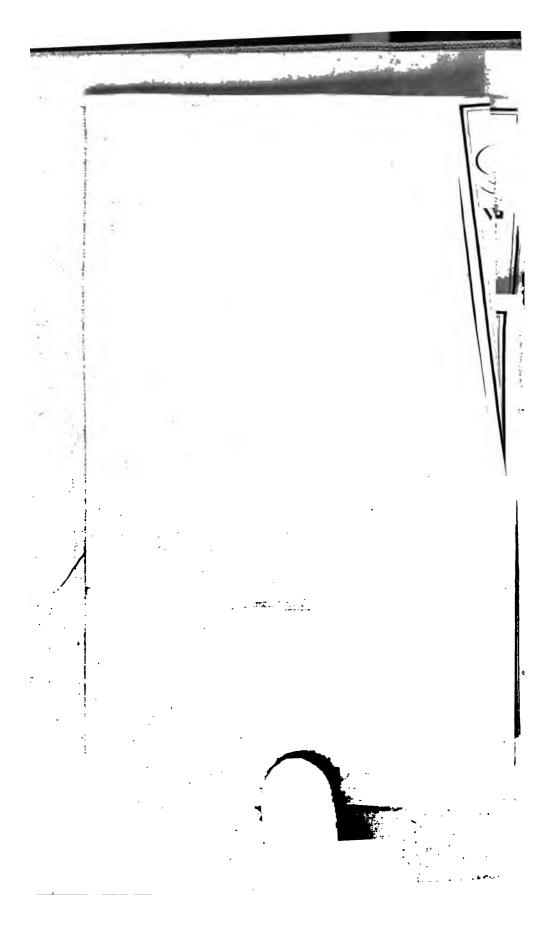
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# Geology and Mineralogy

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#### NEW-LONDON AND WINDHAM COUNTIES.

Geology is a science which is becoming daily of more and more importance to the community, and its utility is more and more manifest. The farmer, engineer, architect, miner, and many of the mechanic arts, are directly benefitted by a knowledge of the facts of this science.

The object of the following sketch, and the accompanying map, is, to give a general idea of the geology and mineralogy of the district under consideration; to shew the extent occupied by each rock and mineral; notice their applications to useful purposes, and describe the agricultural character of the soils formed by their decomposition.

The rocks in all parts of the earth, have been found to be placed in layers, one above the other, in a regular order of succession, and they are generally more or less inclined to the horizon. In consequence of this inclination, the edges of the strata emerge in succession upon the surface, and cause that variety of character in the rocky masses, and in the scenery, which we observe in traversing the country, in particular directions: while, on the contrary, if we travel in the direction in which the strata emerge from the surface, the same soils, rocks, and agricultural and natural productions, continue for considerable distances, with scarce a perceptible variation.

In New-London and Windham counties, the rocks are all, with one exception, stratified, and they dip or incline towards the West-northwest, at an angle of from ten to-fifteen degrees. There are local variations from this general inclination, which will be mentioned in treating of the different rocks. The line, along which the edges of the strata emerge, called the line of bearing, has generally a direction from North-northeast to South-southwest. The rocky strata generally shew themselves in long belts, extending, unbroken, to considerable distances. By referring to the map, it will be observed, that several of the rocks extend from the North to the South line of the State. The precipitous cliffs and steep escarpments of the hills, almost all face to the East, and South-east, while the ground slopes off more gradually to the West and Northwest.—The scenery, soil, and agricultural character, vary for each of the





Gneiss No. 4 is composed mostly of red feldspar, sometimes granular, and carystalline, with smoky and gray quartz, and a little mica. Much of this rock disintegrates easily.

#### (b) Range and Extent.

Gneiss is the predominant rock of New-London and Windham Counties. The other rocks form beds within the gneiss, or overlying masses upon it. The gneiss numbered 1 on the map, is the predominating rock in Lyme, East-Haddam, Salem, Montville, Bozrah, Colchester, Lebanon, Windham, Lisbon, Canterbury, Chaplin, Mansfield, Ashford, and Woodstock; and it is abundant in Brooklyn, Hampton, Pomfret, Thompson, and Franklin. The gneiss numbered 2 on the map, occupies a portion of Norwich, Preston, Groton, Montville, Waterford and New-London. The gneiss No. 4 of the map, is the prevailing rock of Stonington, North-Stonington, Voluntown, Sterling, a part of Killingly, Thompson, Planfield, and Griswold, in Connecticut, all the western part of Rhode-Island, and it extends on the north into Massachusetts.

#### (c) Elevation and General Character of the Hills.

The gneiss rarely forms hills of any great height. The ridges are sometimes 200 or 300 and sometimes 400 feet above the adjacent vallies. The hills are generally long heavy swells, which are sometimes abrupt, and even precipitous on the east and south east sides. The gneiss hills running south west from Norwich, to the north of the Norwich and Essex turnpike, and those of Sterling, Voluntown, North Stonington, Griswold and Killingly, are the heighest.

# (d) Inclination and Thickness of the Strata.

The strata were observed to incline to the west and west northwest at an angle of from 10 to 15 degrees, but there are some local variations in the dip of the gneiss. Passing from West Woodstock to Westford in Ashford, the rocks in and near Boston-Hollow are highly inclined,—some are nearly vertical, and in some places they are contorted. They are also observed contorted in the bed and banks of Mount Hope River, between Chaplin and Mansfield.

On Stone-Hill and Flat-Rock, between Plainfield, Sterling, and Voluntown, and in all that range of hills north to the Moosup River, the gneiss rock dips to the north north-west at an angle of from 6 to 8 degrees.

In the western part of Voluntown, half or three-quarters of a



mile west of Treat's City, the rocks are in almost every variety of position, and are often curved and contorted. In the vicinity, rocks of granite, hornblende rock, and sienite, and powerful veins of some of these occur.

In Lebanon, at the quarries near Goodstone-Hill, the strata are in some places nearly horizontal, in others they are curved into an arched form enveloping the small swells, and transversed in vari-

ous directions by veins of quartz.

The gneiss surrounding a great part of the sienite of Lebanon, dips so as apparently to pass under the latter rock. The gneiss on the East has the usual dip to the West-northwest, but at Willimantic, the strata dip to the East, and Southeast, between that place and Columbia, they dip to the Southeast, and in some parts of Lebanon, they dip to the East. Veins of granite, sienite, and greenstone, traverse the strata of gneiss in every direction, from this mass of sienite, to the distance of several miles. The veins are often several feet in thickness, and are most abundant to the North-northwest, and West of the sienitic mass.

The gniess from 2 miles Southwest of Norwich city, to near Gardner's Pond in Bozrah, dips to the North-northwest, at an angle of from ten to 30 degrees, and often presents steep and nearly perpendicular cliffs, from 200 to 300 feet high. These cliffs may be conserved in many places, on the North of the turnpike leading

from Norwich city to Essex ferry, in Lyme.

The gneiss between Lyme and Waterford, is sometimes indistinctly stratified, and much of it may be called granite, and some of it stratified granite. The strata, generally, dip to the North and Northwest, from 10 to 30 degrees, but in some instances they are nearly horizontal, as may be seen in some of the hills to the North of the road leading from Essex ferry, from Lyme town, to New-London. Veins of reddish granite, like that of Stonington, traverse the strata, and large boulders of gneiss and granite are very abundant on the surface.

The thickness of the gneiss Nos. 1, 2 and 4, cannot be estimated with any reasonable degree of accuracy, on account of the variation in the inclination, and the series of faults that traverse these strata, in a North-northeast and South-southwest direction. If the thickness be estimated from the angle of the dip, and the breadth of these rocks on the surface of the earth, the western branch of No. 1 could not be less than 10,000 feet, and the eastern one, between Brooklyn and Hampton, 1500 to 2000; the western branch of No. 4, 1000, and its eastern at least 8,000 feet thick.

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# (e) Phenomena of Water and Springs.

Water is easily obtained in any part of the district underlaid by gneiss, by digging from 10 to 30 feet. The water is generally soft and pure: springs are abundant, and the country well watered by streams that rarely fail during the dryest seasons.

# (f) Agricultural character.

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The gneiss No. 1 is governed by what may be called a hard, and rather, poor soil. It is often quite stony, difficult to work, and is soon exhausted unless manured. The valleys and plains have a different character, but they belong to the tertiary and allevial deposits, where their agricultural character will be discussed. The soil of this rock makes good grazing land. Indian corn, rye, eats, and potatoes, are the most successful crops. The white mulberry thrives well on this soil, and the silk, made in some of the towns on this tract, is a source of considerable revenue to the cultivators.

In some of the towns, this gneiss decomposes by the action of the weather, into a kind of sand or gravel. The feldspar and mica of the rock, contain potassa, and as these minerals are continuelly undergoing decomposition, the potassa liberated, serves as a stimulant to vegetation. From a similar source all the potassa of land plants is derived: and all trees and plants, except those growing upon the purest siliceous sands, contain some of that alkali. The ashes of almost all land plants, taste strongly of potash. The rocks themselves are a powerful manure, if pulverized and sowed upon the soil. Some of them would perhaps prove as beneficial as gypsum.

Gneiss No. 2, is a very hilly, rocky, and rough district, The land is difficult to work, and of very moderate fertility, except in the valleys and along the streams. Indian corn, rye, oats, and potatoes are the principal crops. The land is good for grazing, and the mea-

dows give good crops of hay.

Gneiss No. 4 is a rough and uneven tract, requiring hard labor of the husbandman to secure moderate crops. The country is not us uneven as gneiss No. 2, but is, in some parts, a still more meagre and unfinitely soil. The principal crops are corn, rye, oats, and postatics. Pine is a common tree on some parts of this tract, and postaticularly on a long narrow strip of land, passing by Robbins' Therefore Tolunown, and thence North northeast through Governity, and Foster, in Rhode Island. On the pine lands of this tract, the rock readily disintegrates into a gravel and sand, without ap-

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pearing to undergo further decomposition. This tract of decomposing gneiss, is crossed on the road from Pomfret, Killingly, Plainfield, and Sterling, to Providence.

#### (g) Mineral Contents.

Few mineral substances are found in the gneiss. Quartz crystals are occasionally observed in it. Magnetic oxide of iron is found disseminated in small grains in the rock, in Lyme, Stonington, Voluntown, and in some other places, but it is rare.

Pyrites is not an uncommon mineral, but it is not found in such

quantities as to render it of any value.

Plumbago, or black lead, as it is often called, is common in the West and Northwest part of Ashford, and in Boston Hollow. It has not been found pure enough, or in sufficient quantity to warrant

exploration.

Garnets are not an uncommon mineral in gneiss No. 1. Manganesian garnets, sometimes an inch or more in diameter, occur in this rock, in Thompson, and they are seen in the gneiss and granite on the road from Woodstock to Bolton's Meeting House, in Ashford. A mile or two West of this meeting-house, in the highly inclined gneiss, they form, in many places, a large proportion of the mass of the rock, and are sometimes an inch or two in diameter.

Chlorite is found in the contorted gneiss, with nests of quartz, in the bed and bank of Mount Hope river, between Chaplin and Mansfield. At Willimantic, in Windham, the following minerals may be obtained from the granite veins, which traverse the strata of gneiss, viz:—Precious garnet, in small, but fine claystals; Mica, (white, yellowish, and greenish white,) in large laminæ; Phosphate of Lime, often claystallized; and Cleavelandite, which occurs granular, foliated, and claystallized. The Cleavelandite forms the principal part of the mass, in many of the veins. The masses of Clealvelandite were, at first, mistaken by the people of the place, for a kind of white limestone.

# (h) Application of Minerals and Rocks to Use.

None of the Minerals of the gneiss ranges, are applied to use.

The rocks are quarried in many places. In Thompson, the gneiss No. 1, is quarried 41-2 and 5 miles from Thompson meeting house, on the road to Dudley. Most of the blocks of this stone, are obtained by splitting up the large boulders, which are abundantly scattered over the fields. It is much employed for underpinning.

to houses, for door-steps, and some is used for building. It dresses and works easily, and is a beautiful, strong, and durable building material. Its durability may be inferred, from the blocks having been exposed for ages on the surface of the earth, without being affected by the weather. A good and durable material for building, should be either so compact as not to allow the water to penetrate it, or so porous as to allow the water which may have penetrated, to freeze, without causing it to crumble.

An abundance of this rock may be obtained in many places,

without the necessity of opening quarries.

This range of gneiss is quarried in Woodstock: near Putnam's Wolf den, in Pomfret: between Brooklyn and Hampton: in Westminster Society in Canterbury: in Franklin, Bozrah, Norwich,

Lyme, Montville, Lebanon, Willimantic, and Ashford.

The blocks of gneiss rock, obtained from near the wolf den in Pomfret, are quarried in many places, on that range of hills, within a mile or two of the place specified. Those obtained between Brooklyn and Hampton, and in Westminster, are from the same range of hills. In all these places, the appearance of the stone is the same. It breaks and splits well, dresses easily, and is very durable. It is used for underpinning to houses, door steps, hearths, and jambs. In Bozrah, gneiss has been quarried in small quantities, at Bozrahville. In several places in this town, beautiful and durable building and flagging stones, may be obtained, in any desired quantity. It may with confidence be said, that many years will not elapse, before some of these beds will be wrought. They are but a few miles from water communication, and flagging stones are, even now, brought from the Northwest part of Lebanon, to Norwich: a distance thrice as great as to the beds in Bozrah. Greiss is quarried to a small extent, in several places near the Yantic river, for the various buildings connected with the manufacturing establishments. It is similar to that occurring between Brooklyn and Hampton, but is often contorted.

About 5 miles from Norwich city, on the road to Essex ferry, is a quarry of fine grained gneiss, on the land of a Mr. Parker. It breaks well, but is difficult to dress, and is employed for building in

Norwich city.

In Montville are quarries of the gneiss No. 1. It splits and breaks well, dresses easily, is very durable, and, in addition to the uses which have been mentioned, it is an excellent fire-stone, for such heats as it is exposed to in common fireplaces; but is not sufficiently refractory for furnaces. It is much used in the adjacent

Goodstone Hill: the one on Goodstone Hill belongs to the town, and is employed for building, door-steps, hearths, jambs, &c. The other two quarries yield flagging stones. The flaggs are sent to Norwich city, where a part are used, and the remainder shipped.—These two quarries belong to Messrs. Dewey and Rathbone.

In Willimantic, gneiss No. 1, has been quarried to some extent. Seven Cotton mills, and many of the attached buildings are constructed of this material. The stone is easily procured, in any desired quantity: is durable, strong, easily drested, and a beautiful material for building and flagging. The rocks are faid here in the banks of the river, to a depth of from 10 to 30 feet. They exist out into layers of any desired thickness, from 2 inches to 2 feet; and

the slabs may be obtained of almost any size.

In Ashford, gneiss No. 1 is quarried, one mile South of the Baptist meeting-house in Westford. It perfectly resembles that near New It is used for building, underpinning, Boston, in Thompson. hearths, jambs, the backs and sides of fireplaces, and for deor steps. In Ashford Woods, in the East part of Ashford, much of the gneiss is procured for the same purposes as above. They both dress easily. Much of the rock from these quarries, cannot be distinguished from granite. When seen in the faces of the hills, it may be called stratified granite. In masses of considerable size, there cannot be traced any slaty texture, or striped aspect. It is, generally, rather fine grained, and contains minute crystals of precious and common garnet. It is easily blocked out, and dressed, and it makes a beautiful building stone. Some of the dressed stones are carried as far as Providence, and it is employed in most of the adjacent towns.

Gneiss No. 2 of the map, is quarried in Waterford, at Taber's Hill, 1 1-2 miles southeast of Flanders, on River-head, in Lyme, on the west side of the Niantick river. It is an excellent building material, of a reddish gray colour: easily dressed, and very durable. It is employed for building, and the various uses to which dressed

stones are applicable.

This rock is also quarried in Montville and Groton.—In Preston. on the neck of land between the Thames and Poquetannock rivers, is a quarry of this rock, from which much of the building stone of Norwich is derived. It is precisely similar, in appearance, to the rock of Groton and Waterford. The rock of these quarries, is much contorted, but it breaks well, and dresses easily.

Gneiss No. 4, is quarried in most of the towns, through which it

passes; but in none is it wrought to any considerable extent.—It breaks well, and dresses easily: is generally of a reddish color, and is very durable. A tract of this rock has already been described, which disintegrates rapidly, and this is not adapted to use, as a building material. Good building stone is obtained at Phelps' Ledge, on Wintechog Hill, 2 1-2 miles Westnorth-west of Milltown, in North Sonington. The stone of this quarry, is also a good fire-stone for fire-places.

The same rock is quarried on Stone Hill, between Plainfield, Sterling, and Voluntown. It is a beautiful and durable material for building, and the various other uses that have been mentioned; and it is used to some extent, by all the adjacent towns. Good quarries thight be opened at Flat Rock, between Plainfield and the line Meeting-house; and this church is on the line, between Sterling and Voluntown. The gneiss No. 4, is quarried on Moosup River, near the "stone factory" in Sterling, and near Lawton's Woolen factory,

in Plainfield.

The gneiss No. 1, 2 and 4, is the only rock in New-London or Windham counties, that is employed to any considerable extent, except as a common wall stone; and these rocks are the predominant ones, over three quarters of the surface of the two counties.—
The value of the rocks, for building, and other purposes, is not yet appreciated. There are many situations, where quarries might be opened, convenient to water carriage, yielding the best qualities of materials, and in inexhaustible quantities.

# II. CONTORTED GNEISS, AND HORNBLENDE SLATE.

# (a) Chemical and External Characters.

This rock varies much in appearance, and from its variable character, and contorted stratification, it may be called contorted gness and horablende state. In some places it is distinctly a gneiss rock, in others hornblende state, and in others intermediate between the two. It is a dark coloured staty rock, of quartz, feldspar, hornblende, mica, chlorite, and epidote. The quartz, feldspar, and mica, or hornblende, feldspar, and quartz, generally predominate, but in some places chlorite abounds, and it approaches to chlorite state. Epidote sometimes forms a proportion of the rock, but this mineral is more often seen in narrow veins, from the thickness of pasteboard to one inch wide, traversing the strata in every direction. The eo-



lour of the rock is often gray, when feldspar forms a considerable portion, but when hornblende abounds, it is dark brown, or nearly black. It is generally fine grained, fissile, hard, and often sonorous, when struck with a hammer, and some of it may be termed clinkstone. In some places this rock disintegrates readily, but generally it shews little tendency to decompose.

#### (b) Range and Extent.

The contorted hornblende slate and guelss occupy a considerable portion of the towns of Thompson, Pomfret, Killingly, Brooklyn, Canterbury, Plainfield, Griswold, Lisbon, Preston, Groton, and a small part of the towns of Norwich, and North Stonington. It is covered along a considerable portion of the middle by a Diluvial and Tertiary deposit. The general direction of this rock is from North-northeast to South-southwest, or North by East and South by West, and it extends uninterrupted from the North to the South line of the State. This rock appears to extend in Massachusetts from Millbury to Billerica, and is a line of continuation of the rock in New London and Windham Counties. Prof. Hitchcock, on his geological map of Massachusetts, calls it hornblende slate, associated with gneiss.

# (c) Elevation and general character of the Hills.

The hills of this rock do not attain any considerable elevation. The principal hilly ranges of this rock are round backed, and from 100 to 200 feet above the adjacent valleys. In many places where the gneiss of this rock approaches, the country is much broken into short abrupt hillocks, composed of pebbles and gravel, or of rock, and sometimes protruding masses occur, with steep escarpments on all sides. Examples of the broken, gravelly, and pebbly ground, may be seen on the Thompson and Boston road, and on the roads leading from Pomfret, Pomfret Landing, Brooklyn, and northern part of Plainfield to Providence. A belt of it extends with few interruptions from Thompson to Plainfield, ranging by Alexander's, Quinebaug, and Moosup ponds, on their East sides, and West of Westfield Meeting House.

The rocky broken ground may be seen to advantage in and about Norwich Town and Landing, thence to Newent, and Jewett City, North and South of Pomfret Landing on the roads to Thompson and Brooklyn, and on a cross road running near the line between Pomfret and Brooklyn, East of the turnpike between those places.

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Some of these hills are 200 feet high, and very steep and precipitous, and some are not more than 20 feet above the adjacent grounds. Some of the long ranges of hills present steep cliffs and escarpments on the East sides, but they are not very common.

# (d) Thickness, Inclination, Veins, Dykes &c.

The strata of this rock generally incline from 7 to 15 degrees to the West-northwest. The horizontal distance across the rock is rarely less than 5 miles. Throwing faults of the strata, which may diminish the apparent thickness, out of consideration, the thickness of this rock could not be much less than 5000 feet. Veins of quartz and epidote traverse this rock formation in every direction.—They are generally perpendicular to the strata. Many of them cut through the rock as regular as a saw could do it. Where the rocks are not contorted, and are cut through by these veins, the stone presents, when broken, a smooth, even surface, perpendicular to the slaty layers. In many places, these veins are mere fissures from which the mineral matter has disappeared, and the masses come out in regular shaped pieces, with plain faces, and are admirably adapted to making smooth, even-faced walls for buildings, or other purposes.

The rocks of this formation are much broken into a series of faults. In many faults, the hills appear to have been cracked across into masses from fifty yards to half a mile in length, and the South ends of the masses tilted up, and the North ends to have slid down over the others. The general dip and direction appear to have remained unaltered. This character may be well observed on the road leading from New London to the Head of Mystic, in Groton, near the four-mile stone from the former place.

In many places it is very much contorted, even in cheed specimens, the slaty layers curving short, and running in zigzag lines in every direction; and in the cliffs, the same may be observed on a large scale. This character may be seen in most of the towns through which the rock passes; but the observer may be referred to rocks and cliffs two miles East of Brooklyn, on the Providence turnpike, and in many places on that range of hills, either to the North or South, for several miles.

# (e) Phenomena of Water and Springs.

The water of this rock is abundant, pure, soft, and easily pro-

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cured. The country is well watered by streams that rarely fail in the dryest seasons.

# (f) Agricultural Character.

The soil furnished by the decomposition of this rock is very productive, and the land is the best of all the lands in the State of Connecticut, that lie East of the Connecticut River valley. The principal crops are hay, corn, rye, oats, and potatoes, pumpkins, and turnips. It is also a good grazing land, and considerable quantities of butter and cheese are made. A large portion of the corn and potatoes is employed in fattening pork, and of the pumpkins and turnips for fattening cattle for market. Oak, walnut, and chesnut, are the principal timber trees. A person passing from Norwich to Plainfield, or Canterbury, and thence through Brooklyn, Pomfret, Woodstock, and Thompson, would see the best lands in the Eastern part of Connecticut.

# (g) Mineral Contents.

The minerals are not numerous in this rock. Steaflite, chlorite, and micaceous oxide of iron, are most common among those that do not form a regular constituent of the rock. Steaflite often forms small beds in this rock, and carbonate of iron is sometimes contained in rhomboidal crystals.

Epidote and micaceous oxide of iron are usually associated in small veins, that traverse the rock in every direction. Good mineral specimens may occasionally be obtained of these minerals, but the micaceous oxide of iron has never been found in sufficient quantity in the district occupied by this rock, to render it of any value. Chlorite has been mentioned as occurring in some places, in considerable abundance. It occurs lamellar, massive and fibrous. Garnets are not uncommon, but are rarely found in perfect crystals. Hornblende occurs massive, crystallized, lamellar, and fibrous. Actynolite is sometimes found. Beautiful specimens of actynolite and chlorite were blasted out of a rock in the bottom of a well at the house of George Martin, Esq., in Brooklyn. Red laminated calcareous spar was thrown out among the fragments of the rock, at the same place.

Magnetic oxide of iron is often embedded in small grains and crystals in the contorted gneiss and hornblende slate, but no locality was observed where good mineral specimens could be obtained.

Pyrites are common, and have often deceived the persons find-

ing it with the idea that it was the ore of a precious metal. Suppluret and carbonate of copper, and copper pysites, have been found in small quantities near Packersville, in Plainfield, and in the East part of Brooklyn. Sphene has been found in small quantities in several places in Brooklyn, Plainfield, and other places.

# (h) Application of Minerals and Rocks to Useful Purposes.

The rock has been quarried and used for building, in a few places as near as Packersville, in Plainfield, in Killingly, Norwich, and Brooklyn. It makes a good wall stone, and even a good building stone, when the layers are plane, and it is intersected by fissures and veins that cut perpendicularly through the rock. The masses have then plane, even surfaces, for the faces of the walls, and the stone is strong and durable. There are some localities where good flagging stones might be obtained. Prospect Hill, half a mile Northeast of Brooklyn Court House, would probably afford abundance of good flagging stones.

None of the *minerals* occurring in this rock have been applied to use, except the steaffte, which is sometimes employed for making inkstands and bullet moulds. It is often called by the inhabitants free-stone, and chalk-stone.

#### III. MICA SLATE.

# (a) Chemical and External Characters.

Mica slate is an aggregate of mica and quartz, but feldspar often forms a part of the mass. The mica of this rock in the district under consideration is white, silvery white, gray, yellow, brown, and copper red. The mica slate disintegrates and decomposes easily, so that it is not often seen in place, but it may be seen near the villages of Franklin, Scotland, Hampton, and Woodstoock.

# (b) Range and Extent.

The mica slate ranges in a direction nearly North-northeast and South-southwest, or North by East and South by West, from Bozrah, through Franklin, Scotland, Hampton, Abington, Pomfret and Woodstock, to Dudley. It re-appears again in Oxford, in Massachusetts, and thence widens out, so as to cover 300 or 400 square miles in that State.

#### (c) Elevation and General Character of Hills.

The mica slate hills do not attain any considerable elevation, but they are among the highest of the district under consideration. The mica slate rocks form a range of hills, having the extent laid down under b. The hill on which Woodstock stands, Pomfret hill, Hampton hill, Pudding hill, in Scotland, and the hill on which Franklin meeting-house is situated, are all parts of the same ridge of mica slate. The hills of this rock are all heavy, round-backed swells of land, and some of them are dome-shaped. Some of the hills are 300, perhaps 400 feet above the adjacent valleys.

### (d) Thickness, Inclination, and Veins.

The thickness of the mica slate rock, taking into consideration the breadth of the rock, and its inclination, cannot be less than 2000 feet. This rock corresponds in inclination with the overlaying and underlaying gneiss No. 1. Its line of bearing is Northnortheast and South-southwest, or North by East and South by West. Veins of quartz and granite are sometimes seen in this rock. The gneiss No. 1, and mica slate, may be seen interstratified near the line where each becomes distinct, between Pomfret and Woodstock, from 1 to 2 miles West of the turnpike between those places, on or near a cross road which runs parallel to the line of bearing.

# (e) Phenomena of Water and Springs.

Water is abundant and easily procured. The water is pure and soft, and the country is well watered by never failing streams.

# (f) Agricultural Character.

This rock furnishes by its decomposition a rich and fertile soil. Vegetation on the mica slate soil is later than on the contorted gneiss and hornblende slate, and the land is said to be rather "cold." The crops and produce are the same as on the latter rock. There are many large dairies on this tract, and the land is inferior to none on the Connecticut River valley, except the contorted gneiss and hornblende slate.

# (g) Mineral Contents.

The minerals found in the mica slate are mostly garnets, with

some staurotide. Pyrites are found in several places, but not in any considerable quantity. A small quantity of this mineral was found near the Southeast corner of Ashford. The persons finding it, deceived by its appearance, and by the circumstance that a man was reported to have secretly wrought a silver mine in the vicinity about a century ago, thought that they had found a mine of the precious metals. Some specimens were shewn to "an old countryman," (as some of the foreigners are termed,) who was perhaps no better qualified to judge upon the subject than themselves, but he was supposed by the individuals to be a perfect adept in mineralogy and metallurgy, because he came from a part of the world where mines were wrought. The foreigner asserted that the ore was a silver ore; he melted some of it, and pretended to have obtained silver from it. The report was circulated in 1830 and 1831, that a rich silver mine had been found in Ashford. Several individuals, ignorant of mineralogy and metallurgy, combined to work it. Much labor, time, and some money, were expended, but no silver was obtained. During the summer of 1831, I was requested to examine the mine, and ascertain if there was any silver in the ore. The ore was found to be iron pyrites, but as this mineral sometimes contains the precious metals in small quantities, a chemical analysis was made of the ore. There was no trace of silver or gold. It is hardly necessary to state, that the " mine" has not since been wrought for the precious metals.

# (h) Application of Minerals and Rock to Use.

The minerals found in this rock have not been applied to any use. The rock is in some places adapted for a flagging stone, as in Franklin, Hampton, Pomfret, and other places. A few flagging stones have been quarried on the declivity of the hill, half a mile East or Southeast of Hampton meeting-house. It has rarely been applied to any use in the district, except as a common wall stone.

#### IV. GRANULAR FELDSPAR ROCK.

# (a) Chemical and External Characters.

The color of this rock is generally gray of various shades, and it is sometimes white. Small scales of mica are often observed in the slaty layers, and the lustre is glimmering. Grains of quartz are occasionally disseminated, but they are not common. Thin layers

of quartz are in a few places interposed between the layers of feld-spar. The feldspar is usually fine grained, with little lustre on the fracture. The fracture is uneven and splintery. The feldspar fuses with some difficulty before the blow-pipe into a white frit, and may, perhaps, be employed in the manufacture of porcelain. This rock may be seen to advantage at Bolles' and Tyler's quarries, in Killingly, in the hills to the North and North-northeast of Moosup pond, in Plainfield, and in many other places.

#### (b) Range and Extent.

This rock, like most of the others in this district, ranges from North by East to South by West, and extends uninterrupted from the North bank of Moosup River, near Lawton's woolen factory, in Plainfield, into the Northwest corner of Rhode Island, and to the South line of Massachusetts.

# (c) Elevation and General Character of the Hills.

The hilly ranges of this rock attain an elevation of from 100 to 200 feet above the adjacent valleys. The hills, from the West, appear to be long, heavy swells of land, with a moderately steep ascent, but on the East side they are often precipitous, and shew the rock in place to advantage.

#### (d) Inclination, Thickness, and Veins.

This rock follows the general dip and inclination to the Westnorthwest, at an angle of 10 or 12 degrees. Calculating from the horizontal breadth and the inclination, it cannot be less than 1500 or 2000 feet in thickness. Veins of quartz traverse this rock, but they are not numerous. The rock is divided by fissures into large tabular rhombic masses, as though there was a tendency towards a crystalline arrangement.

# (e) Phenomena of Water and Springs.

Water is abundant, and easily procured by digging to moderate depths.

# (f) Agricultural Character.

The granular feldspar rock decomposes with difficulty into a stony, porous, and rather poor soil. Much better crops are raised from the soil than would be anticipated from its appearance. The

valleys are generally rich, strong land, and bear good crops of hay, corn, rye, oats, and potatoes. The hills are sometimes good grazing lands, but often they are of little value.

#### (g) Mineral Contents.

Mica and quartz, in small quantities, are found in almost every part of this rock. The quartz is sometimes crystallized, as at the locality of kaolin or porcelain clay. The feldspar rock is in some places either entirely, or partly decomposed, and shows itself in all its stages of decomposition, from the und feldspar to perfect kaolin. A locality of the kaolin is designated on the map, about two and a half miles Northeast of Westfield meeting house, in Killingly. Other localities may probably be found by search.

In some places, the feldspar rock passes into compact feldspar, and some of it looks like a good material for oil stones, for sharpening tools. This compact feldspar may be seen at the cliffs of Half-hill, in Killingly, about one mile South of the Brooklyn and Provi-

dence turnpike, near a saw mill.

Micaceous oxide of iron was observed in small quantities in this

rock, but it is not common.

Pyrites are sometimes found, but they are not common. A story was circulated many years since, that a silver mine had been found in Plainfield, and a person was stated to have extracted a considerable quantity of silver. It originated in finding some of the common pyrites, which were supposed to contain silver, and the report, like many others, was much expanded by being often repeated. Tin ore was said to have been found near the same place, and the ore to have been reduced in Providence, and metallic tin obtained. During the summer of 1832, I examined the locality from which the tin ore was said to have been obtained, but no traces of tin, or any other ore, were observed, either in the slight excavation, the rubbish, or in any of the adjacent rocks.

# (h) Application of Minerals and Rock to Use.

The minerals of this rock are not as yet applied to any use. The granular feldspar, in some places where it is most pure, may perhaps be employed in the manufacture of porcelain. The kaolin might also be employed in the manufacture of porcelain, if it should be found in sufficient quantity. With a small quantity of borax as a flux, it melts into a beautiful transparent white frit.

The granular feldspar is quarried as a flagging stone, at Bolles' and Tyler's quarry, and at Mitchel's quarry, in Killingly. These



quarries are East of the North Society in Killingly. The rock is quarried in small quantities in Plainfield, Northeast of Moosup pond, and in most of the towns through which it passes. This rock is well fitted for a flagging stone. It is very slaty, splits into slabs of any desired thickness, from one inch to one foot, and of almost any desired superfices. Slabs are easily procured of twenty square feet surface, and one inch thick. The stone is hard, sonorous when struck, and require some care in breaking the slabs into the desired form. It is used as a flagging stone in most of the adjacent towns, and a few years since much of it was sent to Providence. The expense of transporting it more than twenty miles, by land, prevents the working of the quarries to advantage.

#### (i) Miscellaneous Observations.

The granular feldspar rock passes, in some places, into a slaty quartz rock, and in others into a mica slate. The granular feldspar and quartz rocks accompany each other, and often pass into each other, and they might have been described as the same formation, but the aggregate masses appear to be different, and to occupy adjacent, but distinct ranges of hills.

# V. GRANULAR QUARTZ.

Numbered on the map.

#### (a) Chemical and External Characters.

This rock is composed of grains, aggregated and adhering without any cement. Generally the rock is fine grained, of a grayish white, and with a tinge of green. In some places the rock is very hard, brittle, and sonorous when struck with a hammer; in others the grains are slightly adherent, the rock frangible, but tough, and long slabs of it flexible to a considerable extent. The rock is slaty, and easily split into slabs of from one inch to six inches thick. The flexible varieties generally have a fibrous aspect on the slabs, from the quartz being intermingled with minute capillary crystals, of a green mineral resembling actynolite. In many places, the rock splits into long, narrow slabs, which have something of a columnar appearance.

# (b) Range and Extent.

This rock extends from the North bank of the Moosup river, in

Plainfield, contiguous and parallel to the granular feldspar rock, through Killingly and Thompson, into or near the Northwest corner of Rhode Island. It reappears between Douglass and Dudley, according to Prof. Hitchcock's geological map of Massachusetts, and extends to Marlborough.

### (c) Elevation and general character of the Hills.

Some of the hills of this rock are 200 feet above the adjacent valleys. They are not often steep. A single long, heavy swell of ground is occupied by this rock. Strannahan's mineral spring, and Day's and Cole's meeting houses, are on this hill, and Chesnut Hill constitutes a part of this ridge. Gneiss No. 4, by its junction with the granular quartz rock, forms the summit of this range of hills.

### (d) Thickness, Inclination, and Veins.

This rock dips to the North-northwest an angle of 10 or 12 degress. Estimating its thickness from its dip and breadth, it cannot be less than 1500 feet thick.

Veins of quartz and granite were observed in some places, but they are not common.

### (e) Phenomena of Water and Springs.

Water is abundant, pure, and easily obtained, by sinking wells to a moderate depth. A mineral spring of chalybeate water issues from this rock on the farm of Mr. Stranahan, in Plainfield, and there is said to be another on the farm of Judge Chase, in Killingly.

# (f) Agricultural Character.

The soil overlaying this rock is very stony, and produces indifferent crops, but it is more productive than would be expected from its aspect. The soil is rather cold. The principal crops are corn and potatoes, with some rye, oats, and hay. The valleys have a strong, productive soil.

# (g) Mineral Contents.

Quartz, in veins and nests, feldspar, mica, hornblende, actynolite calcareous spar, arragonite, stilbite, and byssolite, are among the minerals found in this rock. These may all be found, but rarely in good specimens, at Bacon's quarry, one quarter of a mile East

of Day's meeting house, in Killingly. Pyrites and micaceous oxide of iron are occasionally found, but not in anyquantity.

### (h) Application of Rocks and Minerals to Use.

The minerals of this rock are not applied to any use. The granular quartz rock is quarried at Bacon's quarry, one quarter of a mile East of Day's meeting house, in Killingly, for a flagging stone, and it is also much used as a hearth stone, for lining the back and sides of fire places, and for mantel pieces and door steps. It is also much used as a superficial covering to the underpinning of houses, from its fine color and the smooth surfaces with which it splits. It is quarried at the Chesnut Hill factories for similar purposes, and for whetstones.

#### VI. SIENITE.

Designated by numbers 6 and 7, on the map.

### (a) Chemical and External Characters.

This rock is composed of feldspar and hornblende, or feldspar and augite. It is often crystalline, and composed of coarse grains. The feldspar is light colored, either white or light gray, and some of it is of the variety called glassy feldspar. The hornblende is generally green or black. It is laminar, fibrous, or acicular. The feldspar is easily decomposed, so that the weathered masses present a rough cellular greenish or blackish surface. This character may be observed in the vicinity of the rock in place, but some of the boulders on the shore at Stonington Point, on the point of land one mile and a half or two miles west of Watch Hill light house, the loose stones of the fields and walls on the Norwich and Lebanon turnpike, two or three miles South of the latter place, and similar masses South, Southeast, and Southwest of Lantern Hill, in North Stonington, may be pointed out as being particularly favorable for examining this character.

Some of the sienite of Lebanon approaches to what may be termed a kind of columnar structure. The grains of feldspar and quartz are elongated in one direction, so that the masses of the rock break out in long columnar post-like pieces, but without any regular form. This may be observed in ascending the hill on the North road to Lebanon, one quarter to one half a mile West of the bridge across the Shetucket, on the road from Windham to Lebanon.

In both beds of sienite, in New London and Windham counties, the rock passes through almost all the shades of character in moderate sized masses of primitive greenstone, common greenstone, basalt, and clinkstone.

### (b) Range and Extent.

Sienite occupies but a small extent of surface in the district under consideration. This rock, unlike the others that have been described, does not form a long and narrow stripe, but shews itself in large, irregular, unstratified masses, occupying detached districts, of small extent, when compared with the other rocks.

The signite of Lebanon has its limits laid down on the map, as nearly as could be ascertained without going to much labor or expense. It occupies from 15 to 20 square miles of surface.

The signite of North Stonington covers perhaps 2 square miles. There may be other masses of small extent, that were not observed.

### (c) Elevation and General Character of Hills.

The hills of sienite are among the highest of Windham and New London counties. The Wunnegunset and Obwebetuck hills, in Lebanon, and Lantern Hill, in North Stonington, are among the highest of these hills. The primitive greenstone, as much of the rock on Lantern Hill may be called, forms a hilly ridge, rising like an immense dyke out of the other rocks. The sienite of Lebanon forms some rugged peaks and craggy hills, but most of the tract is in oblong, heavy, undulating swells, that range from Northwest to Southeast. The country to the North, South, and Northwest of Lantern Hill is very broken and hilly, and the rock of many of these hills graduates by almost imperceptible degrees, from the primitive greenstone and sienite of Lantern Hill, to the contorted hornblende slate and gneiss No. 3.

# (d) Thickness, Veins, and Dykes.

This rock not being stratified, and its junction with other rocks not having been observed, there are no data by which to estimate the thickness. Calling the elevation above the surrounding country the thickness, some parts of the mass in Lebanon must be from 500 to 600 feet thick, and Lantern Hill is probably from 400 to 480 feet above the adjacent valleys.

Veins of sienite, granite, and greenstone, traverse and derange the position of the strata, for several miles, in every direction, around the mass of sienite in Lebanon; but the sienite and greenstone veins were observed to be more common in Lebanon, Columbia, Hebron, and Windham, than in any of the other towns.

These greenstone and granite veins may be seen on the Lebanon

and Hartford turnpike, about two miles from the brick meetinghouse in Lebanon. Masses of granite are seen embraced in the sienite, and sometimes in the veins.

### (e) Phenomena of Water and Springs.

Water is pure, abundant, and easily procured by digging a few feet, and the land well watered by never failing streams. mineral chalybeate spring rises near Pease's brook, on Chester Holbrook's land, three miles Northwest of the brick meetinghouse. The spring is from near the junction of the signite and gneiss.

### (f) Agricultural Character.

The sienite of Lebanon easily decomposes, and furnishes a strong, rich, productive, but rather cold soil. The principal crops are corn, hay, rye, oats, and potatoes. The hills that are too steep for cultivation are good grazing lands.

### (g) Mineral Contents.

Feldspar and hornblende constitute the principal masses; but quartz is often seen imbedded in the rocks. The feldspar of the sienite readily decomposes, and where the hornblende is not in such quantity in the rock as to prevent more than a superficial decomposition, the surface is underlaid by a bed of clay, resulting from the decomposition of the rock. The substratum of clay preventing the water from penetrating deep into the soil, causes the surface to be wet and marshy, even on the high grounds. This also causes what is called the cold soil. The mineral spring has already been mentioned.

A red ochreous earth occurs at the foot of Babcock's hill, one mile and a half North of the brick meeting house, on land of Erastus Hutchinson. Titaniferous oxide of iron, nigrine and iserine, are contained in small quantities in the sienite, and the grains of these minerals may be observed, slightly blackening the roads where they have been washed after heavy rains.



The sienite and primitive greenstone of North Stonington do not easily decompose. The minerals observed were hornblende, feld-spar, some quartz, some grains of titaniferous oxide of iron, and sometimes a little chlorite.

### (h) Application of Minerals and Rocks to Use.

The sienite rock is not used either in Lebanon or North Stonington. None of the minerals are employed, except the clay resulting from the decomposition of the sienite of Lebanon, which has been used in making bricks. The bricks of the brick meeting-house were made of clay which was dug on the common, a short distance North of it.

The red ochreous earth occurring in Lebanon, has been sometimes employed as a paint, after having been burnt. The mineral spring is not resorted to, except by a few in the vicinity, who sometimes use the waters in diseases of the skin.

#### VII. GRANITE.

### (a) Chemical and External Characters.

Granite is a rock composed of quartz, feldspar and mica, but it has not the second structure of gneiss. It is generally described as an unstratified rock. Rocks answering this description occur in many places in New London and Windham counties, but they do not form masses of any considerable extent. They form either beds lying between the strata of gneiss and mica slate, and from 10 to 60 feet thick, or else they are in the form of veins, which intersect the strata of those rocks. The veins vary in thickness, from one inch to several feet. Some of the granite is very coarse grained. The feldspar is white or gray in Windham county, and gray or light red in New London county. The quartz and mica are generally light colored, but sometimes smoky. It often disintegrates very readily.

### (b) Range and Extent.

It does not form beds of any extent, but detached masses of from 10 to 50 feet thick, and sometimes one quarter to one half a mile in length. The very coarse grained and porphyritic granite may be seen to advantage in Muddy Brook parish, in Woodstock,





by the mills near the new meeting house. It forms a mass of small extent, in and near the brook, and a considerable mass has been blasted away to give place to a house. The mica is in large plates, and the masses of feldspar often weigh several pounds. The localities of the other varieties are too numerous to mention; but the South part of the hill on which Day's meeting house stands, in Killingly, and some ledges on the road to North Groton from Gale's Ferry, and within one mile of the ferry, may be mentioned The observer as convenient of access, and well characterized. can hardly fail to find an abundance of granite in the South part of New London county. New London, Waterford, Lyme, Montville, Groton, North Stonington, Stonington, Voluntown, Sterling, Killingly, Ashford, and Woodstock, contain very numerous beds of Granite veins can easily be seen at Willimantic, some of them several feet in breadth, and they are interesting to the mineralogist from the minerals they contain.

### (c) Elevation.

This rock does not form hills of any considerable height.

### (d) Veins, &c.

Veins of granite traverse most of the strata of the district, but they are far more abundant to the West-Northwest and North of the sienite of Lebanon, than in other parts. The rocks are not unfrequently dislocated adjacent to them.

# (g) Mineral Contents.

The reddish granite of New London county contains some magnetic oxide of iron, chlorite, and a few garnets. The coarse granite of Woodstock contains a little fluor spar in some places, but good specimens were not obtained. Garnets are also seen in it. The whitish granite of Ashford contains some precious garnets and black tourmatine.

The veins of granite at Willimantic contain fine green and white mica, in large plates, small crystals of precious garnet, red and white feldspar, smoky quartz, magnetic oxide of iron, phosphate of lime in green crystals, and Cleavlandite under all its forms, as granular, foliated, massive, and finely crystallized. Pyrites, crystalized and massive, occur in the veins of granite at the quarries near Goodstone Hill, in Lebanon.

### (h) Application of Minerals and Rocks to Use.

The minerals of the granite have not been applied to use. The granite rock is quarried in small quantities in several places, as in Ashford woods and in Groton. The varieties quarried are fine grained, soft, white granite. It works very easily, and is a good fire stone.

#### STRATIFIED GRANITE.

Prof. Hitchcock, in his sketch of the geology of the Connecticut River valley, in the American Journal of Science, vol. ii. p. 12, remarks of the granite—"Some of it is evidently stratified, and some is not. That which exists in very extensive beds exhibits, so far as I have examined the subject, the most decided marks of stratification. It is not unfrequent to see the bed divided into layers parallel to its roof and floor, and from one to two feet thick. This is readily distinguished from gneiss, by the much greater thickness of the layers, and the want of a stratified arrangement of the ingredients. In other instances, more rare, however, we observe what Saussure would call vertical plates (feuillets,) that is, thick tables of granite perpendicular to the horizon. In all these cases, however, the plates being parallel, or nearly so, the rock would be properly denominated stratified. Examples of these various kinds of arrangement may be found in Conway, Williamsburg, Goshen, and Chesterfield. Yet the greater part of our granite is divided by numerous fissures into these irregular blocks, that bid defiance to precise description." The same remarks may be applied to the granite of New London and Windham counties.-Much of it is in layers of from one foot to ten feet in thickness, and the parts of these layers shew no traits of slatiness, or of having the mica arranged in layers on stripes. The minerals forming the rock are aggregated promiscuously, without any order of arrangement, and the masses can be split equally well in every direction. The stratified granite may be seen in Lyme, Waterford, New London, Montville, Groton, Stonington, Voluntown, Sterling and Killingly. The gneiss between Lyme and Waterford is sometimes indistinctly stratified, and much of it may be called stratified granite. The strata generally dip to the North and Northwest, from 10 to 30 degrees, but in some instances they are nearly horizontal. These facts may be observed in the hills to the North of the road leading from Essex ferry and from Lyme town, towards New London.



Veins of reddish granite, like those of Stonington, traverse the strata, and large boulders of the gneiss and granite are very abundant on the surface. Much of the gneiss No. 4 may be called stratified granite, but most of it is fisile and striped in its aspect. It dips very regularly to the West-northwest, at an angle of about 8 or 10 degrees. When seen in the cliffs, it often shews the appearance of distinct strata, or layers from one to ten feet thick; and any pieces broken from these layers shew no traces of a slaty structure, and cannot be distinguished from granite. There are other places where the rock appears at a short distance to be granite, but when you approach and break off masses, it has the striped aspect of gneiss.

#### VIII. LIMESTONE.

### (a) Chemical and External Characters.

This rock is composed of carbonic acid and lime. It is white or gray, of a finely granular texture, burns to quick lime by being highly heated, effervesces when an acid is poured upon it. It is soft enough to be scratched without difficulty by a knife.

### (b) Range and Extent.

This rock is found only in beds of from one to twenty feet thick, embraced in the contorted gneiss of the Northwest part of North Stonington. The beds, as exposed to view, are of small extent, but they were traced at considerable intervals for several miles to the North, into Griswold. Boulders, of a mixture of hornblende, finely fibrous, green actynolite, &c., are common for two miles East of the lime quarries in North Stonington.

# (c) Elevation and General Character of Hills.

This rock does not form any hills or elevations. The rocks in which the beds of limestone are contained form short, irregular, broken, rocky hills, of little height.

# (d) Thickness, Inclination, &c.

The thickness of the beds has been mentioned to be from one to twenty feet. These beds are included between vertical strata of

contorted gneiss. The line of bearing of both rocks is nearly North and South.

### (g) Mineral Contents.

Hornblende is found in the adjacent rocks, and sometimes in the limestone. Tremolite and actypolite occur in it.

### (h) Applications of Minerals and Rocks to Use.

The minerals found in the limestone are not applied to any use. The limestone itself is quarried and burnt to lime, which is called Stonington lime. It is pretty good, but bears no comparison in quality with that made at Smithfield in Rhode Island, and Thomaston in Maine. The limestone quarries are not as extensively wrought at present as they were a few years since. Only a few hundred casks of lime are made annually at present.

#### RECENT DEPOSITS AND FORMATIONS.

Over the rocks which have been described is found a mantle, or covering of soil, clays, sands, loam, pebbles, and loose rocks. These various materials conceal the rocks in most places; but in many situations, the rocky masses are visible in the sides and on the summits of the hills. The recent deposits are divided into

- 1. Tertiary formations.
- 2. Diluvial deposits.
- 3. Alluvial deposits.

#### 1. Tertiary Formation.

### (a) Chemical and External Characters.

The tertiary deposits of New London and Windham counties are composed of various strata of clay, sand, gravel, and loam. These various materials are arranged in layers, on strata which are nearly horizontal. The gravel generally lies lowest, upon this the clay, and uppermost is found loam or sand. The loam is a mixture of clay and sand, and is of a yellowish color. The clay is the plastic clay of a gray or bluish gray color, very tough and adhesive when wet, and feels soapy to the touch. When dry, some varieties feel unctuous, and others gritty and meagre. The sand is white and yellowish white. It is nearly pure silex. Most of the beds are composed of very fine grains, but some of them consist of grains of



the size of small shot. Small pebbles are sometimes found in the coarse sands. Scales of mica are observed to be pretty abundant in many places. Grains of garnet and magnetic oxide of iron are observed to redden and blacken the sand in some places, on the roads after a rain.

There are some localities in the district, where only one or two of the strata of clay, sand, gravel and loam occur, but often they are all associated.

### (b) Range and Extent.

The beds of the tertiary formation are found in most of the townships of New London and Windham counties. In most of the towns along the Quinebaug, considerable tracts of this formation occur. In Brooklyn, Plainfield, Griswold, and Preston, several thousand acres are covered by the tertiary. Most of the sandy and loamy plains, so common in those towns and in Franklin, Salem, and Lyme, belong to this formation. When these plains are in their natural state, they are generally covered with pines and shrub oaks.

### (c) Elevation and general character of the Hills.

The tertiary deposits of the district under consideration do not attain a height exceeding 100 feet above the rivers and streams in the vicinity. They generally form extensive and nearly level plains, but in many places are diversified by small, round, deep hollows, which are sometimes dry, and often form pond-holes, peat bogs, or cedar swamps.

### (d) Thickness and Inclination.

The strata or layers have been mentioned to occur in nearly a borizontal position. The aggregate thickness of this formation seldom exceeds 50 feet, and is often much less, in fact, in most of the tertiary plains, the rocks are seen projecting through the general level surface, like islands, and the plains, where they skirt streams, very often shew that the bottom of the stream is below the tertiary.

# (e) Phenomena of Water and Springs.

The tertiary plains are generally dry, and water rarely seen; but on the edges of these plains, where they slope off in a bank towards streams or low grounds, water is always abundant. The

water not being able to penetrate the clay, is thrown out by it in numerous springs of cold, pure, and soft water. Some of these springs are pretty copious, and form small brooks. Many of them are called boiling springs, on account of the boiling up of the water, keeping the gravel and sand in a continual motion. The water, instead of being warm, as might be expected from the name (boiling springs) is very cold, and even unpleasantly cold in summer.

### (f) Agricultural Character.

Where the surface of the tertiary formation in New London and Windham counties is loamy, the land is very productive, and easy to till. Where the soil is clayey, which is rarely the case except in low and wet grounds, it bears good crops of grass, but most of it is of an inferior quality, unless the ground be drained. The soil, where the sand is nearly pure, is very poor, but in many places it is much improved by bringing out the mud and peat from the adjacent pond-holes and peat bogs, and spreading them over and mixing them with the soil. The gravelly soil, which makes its appearance in some places, is equally poor as the sand.

### (g) Mineral Contents.

The mineral contents of the tertiary of New London and Windham counties, are arenaceous quartz, (white, yellowish white, fine and coarse,) pebbles and fragments of rock crystal, potter's clay, brick earth, slaty clay, tripoli, polishing clay superior to rotten stone, mica, garnet, and magnetic oxide of iron in small grains.

The mineral springs of Woodstock and Brooklyn issue from the

tertiary. 'They are chalybeate.

# (h) Application to Use.

The sand of the tertiary is much employed in making lime mortar, but that usually employed is too fine. The mortar would be stronger and far more durable, if made from the finer gravel, or the very coarse sand, for laying up walls and chimneys. The potter's clay and brick earth are largely employed for making bricks. With the potter's clay it is necessary to mix some sand, to render the bricks porous, that they may not crack in drying. Bricks are made at two places in Thompson, two in Woodstock, two in Windham, one in Hampton, two in Brooklyn, two in Lebanon, one in Salem, one in Colchester, two in Preston, one in Voluntown; and they might see made to advantage in many other places. Plainfield and

Griswold contain an abundance of the proper materials. Clay may be found in many places, under the sandy plains of the tertiary deposits, and often in the low grounds it is just under the soil.

posits, and often in the low grounds it is just under the soil.

The mineral springs of Woodstock are frequented by some during the summer. The waters are cathartic in their effects.—
They are considered as productive of benefit in cutaneous diseases.

The water of the Brooklyn mineral spring is beneficial in the same cases as those of Woodstock, but it is not used, except for a few miles around.

### (j) Miscellaneous Observations.

Organic remains are not known to have been found in this formation, in New London and Windham counties. In most countries they are abundant.

#### DILUVION.

- (a) Diluvial deposits consist of sands, gravels, pebbles, and loose masses of rock, which appear as if they had been subjected to the action of running water, many of their edges and angles being rounded off, as though they had been tumbling and rolling along the bed of a river, or on the sea-shore. These deposits indicate that they were formed by the action of water, but they are placed in such situations that it cannot ever wash over, or even very near them, under the existing order of things. They also appear to have been formed during the inundation caused by the deluge, whence the name diluvion. The yellow loam found between the soil and the hard pan, is called by some post diluvion.
- (b) The materials constituting diluvion form a large proportion of the surface of New London and Windham counties.
- (c) The hills, valleys and plains are covered indiscriminately by it, but it forms no hills of itself, except small gravel and pebble hills of 20 to 40 feet high.
- (d) Its thickness varies from a few inches to 30 or 40 feet.—
  Its inclination often corresponds with that of the rocks and tertiary deposits over which it happens to be placed.
- (e) Springs are common in this deposit, except when it overlies the sandy plain of the tertiary. The water is good, but much of it

is impregnated with earthy salts, which make the water "hard," and unfit for washing.

### (f) Agricultural Character.

The soil corresponds in its agricultural character with what had been described under the different rocks. The diluvion which covers each of the rocks is mostly composed of their fragments; but where different rocks approach, the fragments of both are mingled near the line of junction, and even to some distance from it.

- (g) The mineral contents are the same as those of the adjacent rocks.
- (h) Sand, which is employed in making mortars, is the only mineral of these deposits applied to use. The rough stones and boulders are employed in common stone walls, and some of the large boulders are split up and used for building, door-steps, hearths, jambs, and underpinning.
- (i) The Diluvial deposits may be seen well characterized about Williamntic and Bull-frog pond, in Windham, between Scotland and Westminster; in Hampton, near Howard's cotton will, on the Boston and Thompson turapike, two or three miles Northeast of the latter place, near Westfield meeting house. Danielson's factory, and Alexander's and Quinebaug ponds, in Killingly.

#### 3. ALLUVION.

#### (a) Chemical and External Characters.

Alluvion consists of sand, gravel, clay, and mud, carried by torrents, brooks and rivers from one place, and deposited in another. Bog iron ore and peat, which are continually forming, the sand and mud which are deposited on and near the sea-store, the sands which drift by the wind from one place to another, are all classed with alluvial deposits. Rocks decomposing in their natural situations into stratified gravel, are called an alluvion.

# (b) Range and Extent.

The alluvion deposits of New London and Windham counties occupy a considerable extent of surface. Almost all the meadows.

swamps, quagmires and peat begs, and much of the land adjacent to the streams, are alluvial.

### (d) Thickness and Inclination.

List thickness is generally small, rarely exceeding ton or fifteen feet. It forms no elevations, except sand banks on the sea shore.

### (f) Agricultural Character.

The alluvial tracts are very fertile. They are generally too wet to raise any thing but grass, but some of the "intervales," or alluvial borders of the streams, are ploughed. They yield great crops of corn.

### (g) Mineral Contents.

Bog iron ore, and magnetic iron sand and peat, are the only minerals. Bog iron ore is found in Brooklyn, Windham, Colchester, Ashford, Woodstock, Thompson, and Voluntown, and probably it may be found in small quantities in all the other towns of the district. It is most abundant in the Northwest and North part of Windham county, where it is often dug for the supply of the iron works at Stafford. Magnetic iron sand is washed up in abundance on some parts of the shore of New London county, as in Stonington, Waterford, and Lyme. Forges have been in operation for the manufacture of iron from these ores, within the recollection of old inhabitants, in Brooklyn, Windham, Colchester, and Lebanon, and there is now one in Voluntown. Peat is abundant, in almost every part of New London and Windham counties. In the North part of the district, almost every farm has peat; and when the wood fails, there will be no want of fuel. It is believed that there is peat enough in Windham county for its supply indefinitely, with its present population. Both varieties, the compact and fibrous peat, are abundant. They make a pleasant fire. It is hardly used, except by a few individuals to keep fire during the night in summer. Some peat has been dug and used in Thompson.

In conclusion, it is impossible not to remark upon the imperfect development that has been made in the mineral resources of the district. Granite, gneiss, and other rocks, admirably adapted for use, of a beautiful texture and appearance, easily wrought,

convenient for transportation, and in exhaustless quantities, clays for the manufacture of pottery, porcelain and bricks, sand for the manufacture of glass, and peat, a fuel almost unknown to the inhabitants, seem to invite the enterprising and industrious to release them from the obscurity in which they have laid for ages and make them useful to the community.











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